

III. REMARKS

1. Claims 19, 35, 41 and 43 are amended.

2. Claims 19-20, 22-24, 27-30 and 47 are patentable under 35 U.S.C. 103(a) over Amateau and Ladousse et al. (US 6729171, hereinafter "Ladousse"). Claim 19 recites rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth between opposed dies, each die having an outer peripheral powder metal gear tooth finishing surface configured to geometrically finish the powder metal surface of each tooth, from tooth tip to tooth root on both sides of the gear tooth, during rolling so that the geometrically finished tooth, from tooth tip to tooth root on both sides of the gear tooth, has dimensional tolerances for power transmission gearing. These features are not disclosed or suggested by the combination of Amateau and Ladousse.

Amateau discloses something different than what is claimed by Applicant. Amateau discloses that each rolling gear die (44, 46) has an outer peripheral profiled surface for rolling the gear teeth surfaces of the workpiece (42) to a desired outer peripheral profiled shape (Col. 12, L. 64 - Col. 13, L. 2).

The Examiner acknowledges that Amateau does not disclose dies that have a powder metal gear tooth finishing surface configured to geometrically finish the powder metal surface of each tooth, from tooth tip to tooth root on both sides of the gear tooth, during rolling as recited in the claims. Combining Amateau with Ladousse does not remedy the above noted deficiency.

Nowhere does Ladousse disclose or suggest rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth. All Ladousse discloses is "[i]n principle, the periphery of the rolling tool or tools is roughly circular (in cross section) or generally cylindrical (with respect to a mean diameter, in the presence of teeth, or of a screw thread). The blank may be preformed, particularly with teeth, in which case, in principle, the tool or tools are equipped with homologous teeth" (Col. 11, L. 64 - Col. 12, L. 2; emphasis added). This portion of Ladousse exemplifies the inability of the Ladousse to produce a "substantially finished outer peripheral profiled gear tooth shape" as recited in Applicant's claim. As is known in the art a rolling die having homologous teeth by definition has teeth that are the same as those found on the gear blank. The homologous teeth of Ladousse by definition do not have any die tooth profile modification which results in a rolling of the blank where shape of the gear teeth is substantially different from the nominally involute gear tooth shape that is desired when rolling gear teeth. In order to properly shape the teeth of the gear blank to achieve the dimensional accuracy claimed by Applicant the die teeth have to be different than the desired nominally involute shape of the gear teeth. For example, in the rolling process claimed by applicant, the rolling dies have the same module and pressure angle but the die tooth shape is not similar to that of the workpiece as the tooth profiles of the die are different from the basic involute shape of the desired gear tooth on the workpiece. If the tool were to have homologous teeth as in Ladousse the gear tooth profile would have to be reworked by a subsequent machining process to achieve the proper gear shape and desired dimensional accuracy. Thus, Ladousse does not disclose or suggest rolling

the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth between opposed dies as claimed by Applicant.

All that is disclosed in Ladousse with respect to final shaping is at column 11, lines 18-22 of Ladousse which recites that in a final phase 86 of operation (b), the load is then controlled (F) for one or more successive phases, so that its change continues to observe a predefined cycle, until a final relative position (Xb) of the tools and the part is reached which tallies with the final dimensions of the part "for this stage of manufacture." However, the final dimensions of the part recited at column 11, lines 18-22 of Ladousse are not finished dimensions as called for in Applicant's claims as evidenced by the use of homologous teeth on the rolling tools of Ladousse. Ladousse also discloses a final sizing phase described at column 11, lines 47-59 however this final sizing phase does nothing more than use position control to obtain a part that meets the roundness criteria defined by the user. This roundness criteria is not defined in Ladousse and cannot reasonably be considered to disclose rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth for geometrically finishing the powder metal surface of each tooth, from tooth tip to tooth root on both sides of the gear tooth as recited in Applicant's claims. All that can be discerned from Ladousse is that all points on some undefined circumference of the part are equidistant from the center of the part and nothing more. This roundness criteria of Ladousse cannot reasonably be considered as substantially finishing an outer peripheral profiled gear tooth shape from tooth tip to tooth root on both

sides of the gear teeth as claimed by Applicant. Thus, it is evident from the disclosure in Ladousse that gears formed by the process of Ladousse have subsequent finishing steps to obtain a "geometrically finished" tooth as recited by Applicant.

In addition, there is absolutely no disclosure whatsoever in Ladousse that the rolling tool or tools have an outer peripheral powder metal gear tooth finishing surface configured to geometrically finish the powder metal surface of each tooth, from tooth tip to tooth root on both sides of the gear tooth, during rolling so that the geometrically finished tooth, from tooth tip to tooth root on both sides of the gear tooth, has dimensional tolerances for power transmission gearing. As described above, the homologous teeth of the rolling tools in Ladousse are not capable of shaping a gear tooth having a nominally involute shape and thus cannot produce a gear tooth having a shape with an accuracy anywhere near that required for power transmission gearing.

Further, it is submitted that Ladousse does not produce a substantially finished gear as claimed by Applicant for the additional reason that the workpiece in Ladousse is merely processed to an intermediate step in the manufacturing process. In shaping the workpiece in Ladousse, Ladousse is specifically concerned with not inducing work hardening in the workpiece so that the workpiece does not deteriorate (Col. 12, L. 60-64). This is contrary to obtaining a "finished" workpiece as, if the workpiece in Ladousse is to be used in any type of high stress application the workpiece would require hardening subsequent to the rolling of the workpiece so that the surface of the workpiece will not be damaged while in use. Subsequent hardening of the workpiece in Ladousse would also involve a finish machining

operation such as grinding to bring the workpiece back to its pre-hardened shape as dimensions of the workpiece would invariably change during the hardening process.

It is noted that the rolling tool of Ladousse is also only designed for pre-finishing operations prior to heat treating the workpiece as evidenced by the statements in Ladousse (described above) that specifically refer to the rolling as having "homologous" teeth, finishing for "this stage of manufacture" and "final sizing" only relating to the roundness of the part and nothing more (i.e. Ladousse requires subsequent grinding or other finishing finish shaping the gear teeth). The process recited in Applicant's claim calls for a die having a powder metal gear tooth finishing surface for plastically deforming and densifying the surface of the gear teeth to form a tooth having a finished geometrical shape where no subsequent shaping is needed.

Thus, it is evident that, when Ladousse is read as a whole, the gears of Ladousse are subject to subsequent heat treatment and machining processes to achieve the "finished" shape of the gear. This is not what is recited in Applicants claims.

Therefore, claim 19 is patentable over the combination of Amateau and Ladousse because neither reference, alone or in combination, discloses or suggests rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth between opposed dies, each die having an outer peripheral powder metal gear tooth finishing surface configured to geometrically finish the powder metal surface of each tooth, from tooth tip to tooth root on both sides of the gear tooth, during rolling so that the geometrically finished tooth, from

tooth tip to tooth root on both sides of the gear tooth, has dimensional tolerances for power transmission gearing.

Claims 20, 22-24, 27-30 and 47 are patentable over the combination of Amateau and Ladousse at least by reason of their respective dependencies.

4. Claims 25 and 26 are patentable under 35 U.S.C. 103(a) over Amateau, Ladousse and "Applicant's Admitted Prior Art". It is submitted that because Amateau and Ladousse do not disclose or suggest all the features of Applicant's claim 19 (from which claims 25 and 26 depend) that the combination of Amateau, Ladousse and "Applicant's Admitted Prior Art" cannot as well. Thus claims 25 and 26 are patentable at least by reason of their respective dependencies.

5. Claims 31 and 32 are patentable under 35 U.S.C. 103(a) over Amateau, Ladousse and Torii et al. (US 4972735, hereinafter Torii). It is submitted that because Amateau and Ladousse do not disclose or suggest all the features of Applicant's claim 19 (from which claims 31 and 32 depend) that the combination of Amateau, Ladousse and Torii cannot as well. Thus claims 25 and 26 are patentable at least by reason of their respective dependencies.

6. Claims 35, 37-39 and 41-46 are patentable under 35 U.S.C. 103(a) over Sonti et al. (US 6779270, hereinafter "Sonti") and Ladousse. Claim 35 recites rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth while engaged with the rolling die having an outer peripheral powder metal gear tooth finishing surface configured to geometrically finish the powder metal surface of

each tooth, from tooth tip to tooth root on both sides of the gear tooth, during rolling so that the geometrically finished tooth, from tooth tip to tooth root on both sides of the gear tooth, has dimensional tolerances for power transmission gearing. This feature is not disclosed or suggested by the combination of Sonti and Ladousse for substantially the same reasons described above with respect to the combination of Amateau and Ladousse.

Sonti discloses something different than what is claimed by Applicant. Sonti discloses that each rolling die has a plurality of teeth (42) and an outer peripheral contoured surface (44) extending between generally parallel spaced lateral surfaces (46, 48) (Col. 4, L. 48-51).

As described above, Ladousse does not disclose the features of claim 35. In particular, Ladousse does not disclose or suggest rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth. All Ladousse discloses is "[i]n principle, the periphery of the rolling tool or tools is roughly circular (in cross section) or generally cylindrical (with respect to a mean diameter, in the presence of teeth, or of a screw thread). The blank may be preformed, particularly with teeth, in which case, in principle, the tool or tools are equipped with homologous teeth" (Col. 11, L. 64 - Col. 12, L. 2; emphasis added). This portion of Ladousse exemplifies the inability of Ladousse to produce a "substantially finished outer peripheral profiled gear tooth shape" as recited in Applicant's claim. As is known in the art a rolling die having homologous teeth by definition has teeth that are the same as those found on the gear blank. The homologous teeth of Ladousse by definition do not have any die tooth profile

modification which results in a rolling of the blank where shape of the gear teeth is substantially different from the nominally involute gear tooth shape that is desired when rolling gear teeth. In order to properly shape the teeth of the gear blank to achieve the dimensional accuracy claimed by Applicant the die teeth have to be different than the desired nominally involute shape of the gear teeth. For example, in the rolling process claimed by applicant, the rolling dies have the same module and pressure angle but the die tooth shape is not similar to that of the workpiece as the tooth profiles of the die are different from the basic involute shape of the desired gear tooth on the workpiece. If the tool were to have homologous teeth as in Ladousse the gear tooth profile would have to be reworked by a subsequent machining process to achieve the proper gear shape and desired dimensional accuracy. Thus, Ladousse does not disclose or suggest rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth between opposed dies as claimed by Applicant.

All that is disclosed in Ladousse with respect to final shaping is at column 11, lines 18-22 of Ladousse which recites that in a final phase 86 of operation (b), the load is then controlled (F) for one or more successive phases, so that its change continues to observe a predefined cycle, until a final relative position (Xb) of the tools and the part is reached which tallies with the final dimensions of the part "for this stage of manufacture." However, the final dimensions of the part recited at column 11, lines 18-22 of Ladousse are not finished dimensions as called for in Applicant's claims. Ladousse also discloses a final sizing phase described at column 11, lines 47-59 however this final sizing phase does nothing more than use position control to

obtain a part that meets the roundness criteria defined by the user. This roundness criteria is not defined in Ladousse and cannot reasonably be considered to disclose rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth for geometrically finishing the powder metal surface of each tooth, from tooth tip to tooth root on both sides of the gear tooth as recited in Applicant's claims. All that can be discerned from Ladousse is that all points on some undefined circumference of the part are equidistant from the center of the part and nothing more. This roundness criteria of Ladousse cannot reasonably be considered as substantially finishing an outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth as claimed by Applicant. Thus, it is evident from the disclosure in Ladousse that gears formed by the process of Ladousse have subsequent finishing steps to obtain a "geometrically finished" tooth as recited by Applicant.

In addition, there is absolutely no disclosure whatsoever in Ladousse that the rolling tool or tools have an outer peripheral powder metal gear tooth finishing surface configured to geometrically finish the powder metal surface of each tooth, from tooth tip to tooth root on both sides of the gear tooth, during rolling so that the geometrically finished tooth, from tooth tip to tooth root on both sides of the gear tooth, has dimensional tolerances for motorized transport vehicle power transmission gears. As described above, the homologous teeth of the rolling tools in Ladousse are not capable of shaping a gear tooth and thus cannot produce a gear tooth having a shape with an accuracy anywhere near that required for power transmission gearing.

Further, it is submitted that Ladousse does not produce a substantially finished gear as claimed by Applicant for the additional reason that the workpiece in Ladousse is merely processed to an intermediate step in the manufacturing process. In shaping the workpiece in Ladousse, Ladousse is specifically concerned with not inducing work hardening in the workpiece so that the workpiece does not deteriorate (Col. 12, L. 60-64). This is contrary to obtaining a "finished" workpiece as, if the workpiece in Ladousse is to be used in any type of high stress application the workpiece would require hardening subsequent to the rolling of the workpiece so that the surface of the workpiece will not be damaged while in use. Subsequent hardening of the workpiece in Ladousse would also involve a finish machining operation such as grinding to bring the workpiece back to its pre-hardened shape as dimensions of the workpiece would invariably change during the hardening process.

It is noted that the rolling tool of Ladousse is also only designed for pre-finishing operations prior to heat treating the workpiece as evidenced by the statements in Ladousse (described above) that specifically refer to the rolling as having "homologous" teeth, finishing for "this stage of manufacture" and "final sizing" only relating to the roundness of the part and nothing more (i.e. Ladousse requires subsequent grinding or other finishing finish shaping the gear teeth). The process recited in Applicant's claim calls for a die having a powder metal gear tooth finishing surface for plastically deforming and densifying the surface of the gear teeth to form a tooth having a finished geometrical shape where no subsequent shaping is needed.

Thus, it is evident that, when read as a whole, the gears of Ladousse are subject to subsequent heat treatment and machining

processes to achieve the "finished" shape of the gear. Which is not what is recited in Applicants claims.

Thus, claim 35 is patentable over the combination of Sonti and Ladousse because neither reference, alone or in combination, discloses or suggests rolling the gear teeth surfaces of the workpiece to a substantially finished outer peripheral profiled gear tooth shape from tooth tip to tooth root on both sides of the gear teeth while engaged with the rolling die having an outer peripheral powder metal gear tooth finishing surface configured to geometrically finish the powder metal surface of each tooth, from tooth tip to tooth root on both sides of the gear tooth, during rolling so that the geometrically finished tooth, from tooth tip to tooth root on both sides of the gear tooth, has dimensional tolerances for power transmission gearing.

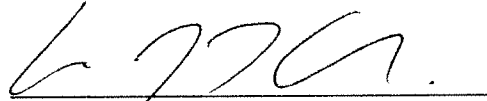
Claims 41 and 43 are patentable over the combination of Amateau and Ladousse for reasons that are substantially similar to those described above with respect to claim 35. Claims 37-39, 42 and 44-46 are patentable over the combination of Amateau and Ladousse at least by reason of their respective dependencies.

For all of the foregoing reasons, it is respectfully submitted that all of the claims now present in the application are clearly novel and patentable over the prior art of record, and are in proper form for allowance. Accordingly, favorable reconsideration and allowance is respectfully requested. Should any unresolved issues remain, the Examiner is invited to call Applicants' attorney at the telephone number indicated below.

The Commissioner is hereby authorized to charge payment for one additional dependent claim and any fees associated with this

communication or credit any over payment to Deposit Account No.
16-1350.

Respectfully submitted,



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